

## Historic, archived document

Do not assume content reflects current scientific knowledge, policies, or practices.



Issued January 25, 1913.

U. S. DEPARTMENT OF AGRICULTURE,  
FOREST SERVICE—CIRCULAR 212.

HENRY S. GRAVES, Forester.

---

# CIRCISSIAN WALNUT.

BY

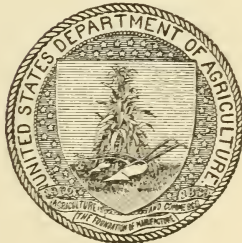
GEORGE B. SUDWORTH,

*Dendrologist,*

AND

CLAYTON D. MELL,

*Assistant Dendrologist.*



WASHINGTON:  
GOVERNMENT PRINTING OFFICE.  
1913.

---

---

**A**DDITIONAL COPIES of this publication  
may be procured from the SUPERINTEND-  
ENT OF DOCUMENTS, Government Printing  
Office, Washington, D. C., at 5 cents per copy

---



## CONTENTS.

---

	Page.
Common names.....	5
Uses.....	5
Native and cultivated range.....	6
Sources of supply.....	6
Logging and transportation to market.....	7
Waste in preparing logs for shipment.....	8
Consumption of Circassian walnut in the United States.....	8
Gross characters of the wood.....	9
Minute characters of the wood.....	9
Substitutes for Circassian walnut.....	11

## ILLUSTRATIONS.

---

	Page.
PLATE I. Veneer from straight-grained logs.....	12
II. Veneer from crooked and irregular logs.....	12
III. Transverse section of the wood of Circassian walnut.....	12
IV. Tangential section of the wood of Circassian walnut.....	12
V. Radial section of the wood of Circassian walnut.....	12



# CIRCASSIAN WALNUT.

---

## COMMON NAMES.

Circassian walnut (*Juglans regia* Linn.) yields one of the best known and most expensive cabinet woods on the American and European markets. Botanically, Circassian walnut is the same as the so-called English walnut, the latter name being used almost exclusively by those who grow the tree for its nuts; while the former is the one generally applied to it by manufacturers and other consumers of the wood. Of all the common names given it, English walnut is the least appropriate, because the tree is not a native of England, but was brought there long ago from Asia and cultivated. Obviously, the most appropriate name for the tree is Circassian<sup>1</sup> walnut, since this indicates at once its true origin and natural range. Other common names applied to it are royal walnut, Italian walnut, European walnut, French walnut, Persian walnut, Austrian walnut, Turkish walnut, and Russian walnut. In Italy the tree is called ancona auvergne; in Persia, jaoz, charmagz, and akrot; in Greece, carua, caryon, Persicon, and basilikon (kingly tree); in France, noyer; in Germany, englische Wallnuss and gemeine (common) Wallnuss; in Spain and Cuba, nogal; in South America nogal, nogal America, and nogal comun.

## USES.

Probably no other wood has served so many purposes as Circassian walnut. Long before the discovery of America it was the most popular of all woods for furniture and interior finish, while throughout southern Europe the wood is still used locally for all grades of furniture. Its present high cost, however, prohibits its use in this country for any but the very finest furniture and cabinet work. When more abundant, its use abroad also included coach making, turnery, toys, press screws, joinery, carved work, and wooden shoes. During the wars of the eighteenth century Circassian walnut was used so extensively for gunstocks that even at that early date the supply was seriously decreased.

The wood of old trees is especially valuable on account of its dark color and beautiful veining, strength, lightness, and elasticity.

---

<sup>1</sup> This term is derived from Circassia, a region of western Caucasus, now included in the Russian Government of Kuban and Chernomorsk, lying between the Black Sea on the southwest and the river Kuban on the north.

When particularly well marked it is one of the most attractive and valuable of veneer woods, particularly for furniture. The best grades often bring a higher price than mahogany, especially in the United States.

#### NATIVE AND CULTIVATED RANGE.

Adapted to a wide range of soils and climatic conditions, Circassian walnut is one of the most widely distributed of commercial timber trees. It is native to the eastern slopes of the Caucasus, and extends eastward along the valleys and slopes of the Hindoo Koosh to the southern foothills of the Himalaya Mountains, where it is said to form large, pure forests. From there it extends southward to northern India, and to the mountains of upper Burma. Some authorities claim that it stretches across the continent to Japan.

Sir Dietrich Brandis describes trees from the region northwest of the Himalayas as being 28 feet in circumference and from 100 to 120 feet in height. It is probable that the species reaches its best development in the Caucasus Mountains. In the Sikkim Himalaya, according to Dr. Joseph Hooker, an English botanist, Circassian walnut inhabits mountain slopes between elevations of 4,000 and 5,000 feet, while in northern India it is found at elevations of from 3,500 to 11,000 feet, being most abundant in Kashmir. It grows also to some extent in the arid valleys.

In northeastern India (Darjeeling) Circassian walnut is planted extensively for its fruit. It has been widely planted in Europe, having been grown successfully as far north as Warsaw in Russia, and as far south as Italy and the Mediterranean islands. According to Pliny it was introduced into Italy from Persia. This must have happened at an early date, since it is mentioned as existing in Italy by Varro, who was born 116 B. C. There is no authentic record as to when Circassian walnut was brought into the United States. Here it has been planted from the Atlantic to the Pacific, the greatest attention having been given to it on the Pacific coast, where it is grown for its nuts. Since wherever it is grown in the United States it is for this purpose, the wood produced is of little importance.

#### SOURCES OF SUPPLY.

No other timber tree has been exploited more than Circassian walnut, and the demand for it has always been greater than the available supply. Much of the Circassian walnut now used in various parts of the world comes from the shores of the Black Sea, and from other regions as far as Persia. Large shipments come from India to England, whence some is shipped to the United States. The greatest outlet of southern Russia is probably from Odessa, and the bulk of the timber is shipped direct to the United States.



None of the wood grown in western Europe is shipped to this country. That grown in England is not equal in quality to the wood from the Caucasus, though it is much sought after for furniture, and particularly for gunstocks. In fact, the demand for these purposes in western Europe is so great that the domestic supply invariably fails to meet it, and at times there has been a great dearth of the wood there. Realizing the importance of a home supply, France passed an act in 1720 prohibiting the exportation of Circassian walnut. The shortage of supply in Europe has been due chiefly to the enormous demand for gunstocks in times of war. The wood of approximately 12,000 trees was required early in the nineteenth century for this purpose alone. In consequence, large numbers of plantations were established throughout England, France, and Germany. Some of these were very extensive; one founded in 1818 near Boulogne, France, contained about 30,000 trees.

Widespread consumption of Circassian walnut for gunstocks and furniture continued in Europe until its cost became very high and importation began from the Orient. Liverpool and London were then, and still are, the chief ports of entry from which Circassian walnut is reshipped to Continental Europe and to some extent to the United States. During the last 20 years, however, American dealers have imported directly from the country where the wood is cut, and only small shipments come to this country via London and Liverpool.

Profit from growing Circassian walnut in Europe for timber is much less than it once was, both because large quantities (about 20,000,000 feet) of our native black walnut are annually shipped there, and because the wood is now coming from the East.

#### LOGGING AND TRANSPORTATION TO MARKET.

Circassian walnut grows for the most part either in very open stands or scatteringly in forests of other species. Trees grown in dense stands do not produce the most highly prized qualities of timber. Those which yield the best wood grow in the open, often in unfavorable situations, and as a rule have small, short, crooked trunks. Such trees are so scattered and so few in number in any one locality that lumbering is made very expensive. Extensive logging has, in fact, never been carried on anywhere in the tree's range.

The wood is so heavy when green that it sinks in water and can not be floated. Logs must be hauled from the forest to the shipping point over poor roads and by crude equipment. Transportation is becoming more and more difficult and expensive, especially since logs have to be obtained at points far from water transportation, the timber on more accessible areas having been exhausted. Cir-

cassian walnut logs at shipping points are now bought by the pound or ton, never by board foot measure. The average price paid for logs at shipping ports is from \$80 to \$100 per ton, or a little more than 4 cents a pound. This high cost is due partly to the great expense of delivering logs overland, partly to the fact that most of the trees produce small, poorly formed, or defective sawlogs, and partly to the fact that a great deal of territory has to be gone over to obtain a shipload of logs. Were it not for the exceptionally high value of the wood no one could afford to lumber walnut forests.

Unlike most other saw timber the straighter and better-formed trees do not yield the most highly prized quality of lumber. It is usually the crooked, irregular logs that contain the most highly figured wood, the logs affording such material being valued according to the amount they contain. Single trees containing choice burls, crotches, or fine bird's-eye effects have sold for over \$3,000. Timber of this exceptional quality is now scarce, while all grades in fact are becoming more difficult to obtain. Even a considerable advance in price would not in all probability greatly increase the present imports. All useful parts of the trees are now saved, even to the stumps and other pieces formerly left to rot.

#### WASTE IN PREPARING LOGS FOR SHIPMENT.

Russia, which is at present the chief source of the Circassian walnut which comes to American markets, has an export duty of \$20 per ton. In addition to this there are port and town charges, which help to swell the cost of the wood. Logs are all sold from the forest with the bark and sapwood on. Since only the heart wood is used, these are hewn from the logs before final shipment in order to reduce the cost of transportation. After the logs are thus prepared for shipment they are carefully inspected and weighed by customs officials before being loaded on ships. The hewing of the logs is expensive, in that it is a crude way to remove useless parts, and wasteful, because the sapwood removed brings the shipper nothing, although he has been obliged to pay for it. The average thickness of the sapwood taken off is from 4 to 6 inches. Unsound or defective parts of the logs are also removed, since the importer must pay freight alike on sound and unsound timber. However, when logs contain finely figured but slightly unsound pieces, which might be suitable for veneer, the defects are usually allowed to remain.

#### CONSUMPTION OF CIRCASSIAN WALNUT IN THE UNITED STATES.

The exact amount of Circassian walnut shipped into this country can not be ascertained because it is included under the general head of cabinet woods. However, the United States is believed to be the greatest consumer of Circassian walnut, especially of the highly

figured grades. During 1911 the consumption in 14 States was 852,807 board feet,<sup>1</sup> which may safely be assumed as only about one-third of our total consumption. Table 1 shows the amounts used in the 14 States referred to.

TABLE 1.—*Circassian walnut consumed in 1911 in States for which reliable data were obtainable.*

State.	Board feet.	State.	Board feet.
Missouri.....	2,400	New Hampshire.....	1,200
Michigan.....	252,557	Louisiana.....	1,000
Oregon.....	300	Kentucky.....	20,000
Maryland.....	506,500	Wisconsin.....	5,200
North Carolina.....	3,000	Vermont.....	1,000
Illinois.....	40,500	Connecticut.....	3,800
Virginia.....	350		
Massachusetts.....	15,000	Total.....	852,807

### GROSS CHARACTERS OF THE WOOD.

Circassian walnut weighs about 45 pounds per cubic foot, is hard, compact, easy to work and split, moderately tough, and durable in contact with the soil. It shrinks very little in seasoning and does not crack or warp. The sapwood is a pale fawn color or almost white. The heartwood is dark chocolate brown, often shading from light brown to black. Burred and other highly figured forms of the wood take a beautiful finish. Radial (edge-grain) and tangential (bastard) cut boards are always lighter in tone than transverse sections. In light-colored sticks the annual rings of growth are clearly but not strikingly defined, but in dark specimens are very indistinct. The pores are irregularly scattered. (Plate I.)

The wood of trees grown in poor upland and hilly soils has a beautiful fine grain and texture, while the wood grown in rich lowland soils is much coarser and less beautifully marked. The best qualities of timber are obtained from vigorous sound trees over 100 years old, which rarely have a clear length of more than 12 feet. The most beautifully veined wood is in the roots and burls, the latter being particularly common on trees near the Black Sea. The grain in such growths is so interwoven and twisted as to produce the most curious and irregular figures, giving the wood an unequal value for veneer. (Plate II.)

### MINUTE CHARACTERS OF THE WOOD.

Since the increasing scarcity of Circassian walnut may result in attempts to substitute for it woods difficult to distinguish by superficial characters, the chief structural characters of this wood (vessels, tracheids, wood fibers, wood-parenchyma fibers, and pith-rays) are illustrated and briefly described. Most of them can be seen with an ordinary pocket lens.

<sup>1</sup> Compiled by Branch of Products, Forest Service.

*Vessels* or pores (transverse section) (Plate III, *v.*) are uniformly distributed. In early wood or inner part of each annual ring (Plate III, *e. w.*) they are usually oval in outline, with an average tangential diameter of 0.16 millimeter, while in late wood (Plate III, *l. w.*) they are round and have an average diameter of 0.12 millimeter. The size of the pores diminishes gradually from early to late wood, so that the inner and outer portions of annual rings of growth are alike in general appearance, and similar to those in gums and cottonwoods. In very broad annual rings the vessels become smaller toward the outside, thus making the difference between early and late wood more conspicuous than in narrower ringed wood. The pores are arranged singly, or occasionally in pairs, separated by a partition wall on their tangential sides. It is rare that pores are grouped in threes or fours, and then only in very narrow rings of growth, where they may be somewhat radially arranged.

The walls of vessels are much thinner than those of the surrounding wood fibers, and thinner also than those of vessels of our native walnuts. In longitudinal section (Plate IV, *v.*) the vessel segments are from one to three times as long as wide, and usually have oblique terminal partition walls (slanting ends), which always face the pith-rays and are always wholly absorbed, leaving a large opening between the abutting segments, known as a simple perforation. The oblique line, Plate IV, *c. w.*, shows a portion of the unabsorbed cross-wall near its outer edge where the two segments meet. The vessel walls are densely and uniformly marked with bordered pits (Plate IV, *b. p.*). The upper and lower surfaces of the vessel segments (Plate IV, *v.*) have been cut away, leaving only a small portion showing the pits, *b. p.*

*Wood fibers*<sup>1</sup> (transverse section) (Plate III, *w. f.*) are arranged more or less irregularly. They have thin walls, comparatively large cell cavities, and in outline are usually round, except in the case of fibers which border vessels or occur in the last few rows in the late wood (Plate III, *l. w.*), where they are invariably flattened radially or tangentially. They are often compressed tangentially also where they border pith-rays. Wood fibers (longitudinal section) (Plates IV and V, *w. f.*), which are long pointed (acuminate) or occasionally<sup>2</sup> forked or notched at both ends, are from about 1.0 to 1.8, with an average of 1.4, millimeters in length and 0.02 millimeter in diameter. The pits in the walls of wood fibers are few, small, simple, and chiefly on the radial walls.

*Wood-parenchyma fibers* (transverse section) (Plate III, *w. p. f.*), readily seen with a hand lens, form narrow, tangential, slightly colored lines, which are often somewhat wavy, especially near the

<sup>1</sup> In the late wood these elements occur in distinct radial rows, which can, however, be seen only under the high power of the microscope.

<sup>2</sup> Only in gnarled and slowly-grown woods.

early wood (Plate III, *e. w.*). They are seldom more than one row of cells wide. In a magnified section (Plate V, *w. p. f.*), the character and composition of wood-parenchyma fibers are clearly shown. Each fiber is composed of from 5 to 10 small oblong cells<sup>1</sup> arranged in a perpendicular row, and closely packed between the wood fibers. The upper and lower cells of all wood-parenchyma fibers taper to a point. Wood-parenchyma fibers are almost one-third shorter than the average wood fiber. Crystals of calcium oxalate and carbonate, so numerous in the wood-parenchyma fibers of black walnut (*Juglans nigra*), are seldom found in Circassian walnut.

*Pith rays* (Plate III, *p. r.*), which are most conspicuous in a smooth transverse section, appear as numerous, fine radial lines composed of short parenchymatous cells arranged in rows from 1 to 5, seldom more than 4, cells in width. As a rule the rays are straight, though occasionally they bend slightly around large pores or vessels in the early wood of wide annual rings of growth. In a tangential section they are cut off at right angles to their axes (Plate IV, *p. r.*), exhibiting more clearly their form and character. Some rays are spindle-shaped and composed of numerous irregular cells, while others are only a single cell wide and from 1 to 10 cells high. In a radial section the pith-rays are cut longitudinally. The pitting of the cells composing the rays is shown very distinctly under the high power of a compound microscope. The individual cells of a ray differ very little from those which make up wood-parenchyma fibers. Pith-rays (tangential section) in the wood of Circassian walnut are spindle-shaped, and from 1 to 5 cells wide, while in butternut, a closely related species sometimes substituted for the latter, the pith-rays are spatulate and usually from 1 to 3 cells wide.

#### SUBSTITUTES FOR CIRCASSIAN WALNUT.

Although it is usually easy for expert buyers to recognize true Circassian walnut in the logs, it is often difficult to distinguish the wood from some of its substitutes when these have been skillfully stained and finished. There are many good African, Asian, and South American woods which are similar in structural qualities to Circassian walnut, though none possesses the magnificent figure, delicate tones, and velvety texture of the walnut. Chief among the woods which resemble Circassian walnut in general appearance is the so-called satin walnut, tassel wood, or red gum (*Liquidambar styraciflua* Linn.) of the United States, the wood of which has been sold as Circassian walnut both for furniture and for interior finish. The wood from butt logs of red gum is often handsomely veined and mottled, and is strikingly similar in general appearance to Circassian

<sup>1</sup> When magnified 100 diameters cells show numerous, small, round openings called simple pits, which connect the cell cavities of each element with those of adjoining elements.

walnut. The much finer grain and more numerous and much smaller pores of red gum, however, can be depended upon to distinguish it from the latter. Our native cotton gum (*Nyssa aquatica* Linn.) is another wood occasionally sold as Circassian walnut. It has a similar texture,<sup>1</sup> but the lack of pronounced figure readily distinguishes it.

Among the true walnuts and related woods which may appear as substitutes are Caucasian walnut (*Pterocarya caucasica* C. A. Mey. = *P. fraxinifolia* Spach.), Japanese pterocarya (sawa-gurumi) (*Pterocarya rhoifolia* S. et Z.), butternut (*Juglans cinerea* Linn.), Jamaican, or West Indian, walnut (*Juglans insularis* Griseb.), and nogal (*Juglans australis* Griseb.).

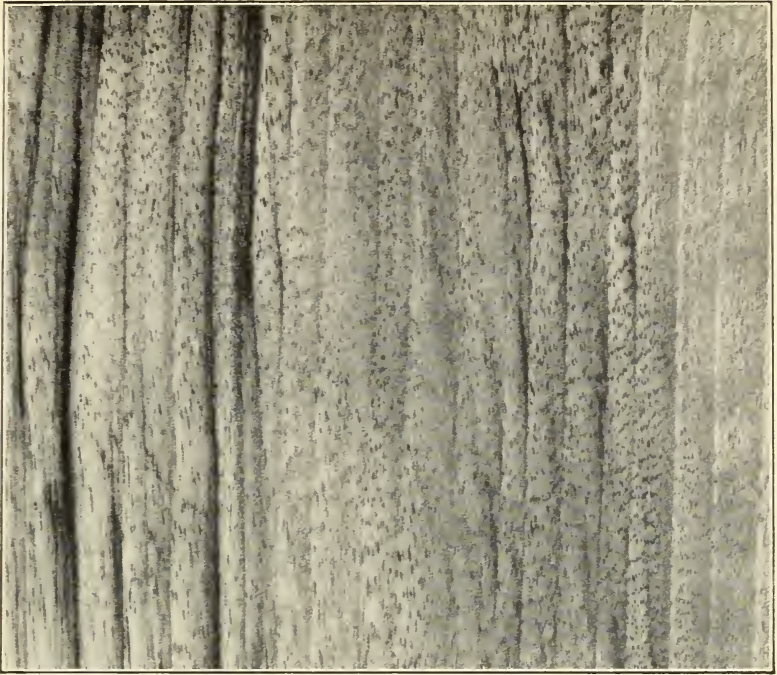
Owing to the similarity of names, Caucasian walnut is sometimes confused with Circassian walnut, but the wood of the former lacks figure, is harder, denser, and much inferior from the cabinetmaker's standpoint. The entire absence of figure in the Caucasian walnut at once serves to distinguish it from the Circassian walnut. The Japanese pterocarya is an important timber tree, and although its wood somewhat resembles Circassian walnut in its minute structural characteristics, its gross appearance is very different, and its substitution should be easily detected. This Japanese wood is white, soft, very light, and straight grained, with rows of open pores marking the annual rings of growth. A writer on Japanese woods states that it might be mistaken at first glance for white pine.

The butternut is the only one of our native woods that could be substituted to any considerable extent for Circassian walnut. Some of its grades are remarkably similar in general appearance to the less highly figured ones of the latter. The light and dark brown, and black veining of the Oriental wood, however, readily distinguishes it from the solid brown shades of the butternut. Three closely related Asiatic walnuts<sup>2</sup> have wood similar to that of the Circassian walnut, but are nowhere sufficiently abundant to play a large part in possible substitutions. The little known West Indian walnut and the nogal, or South American walnut, are excellent woods, but only limited supplies are available, and hence are likely to find their chief use in local cabinetwork. Nogal is especially desirable as a cabinet wood because of the ease with which it can be worked and the beautiful finish it takes. Both of these woods are coarser grained than Circassian walnut, and when well finished resemble black walnut.

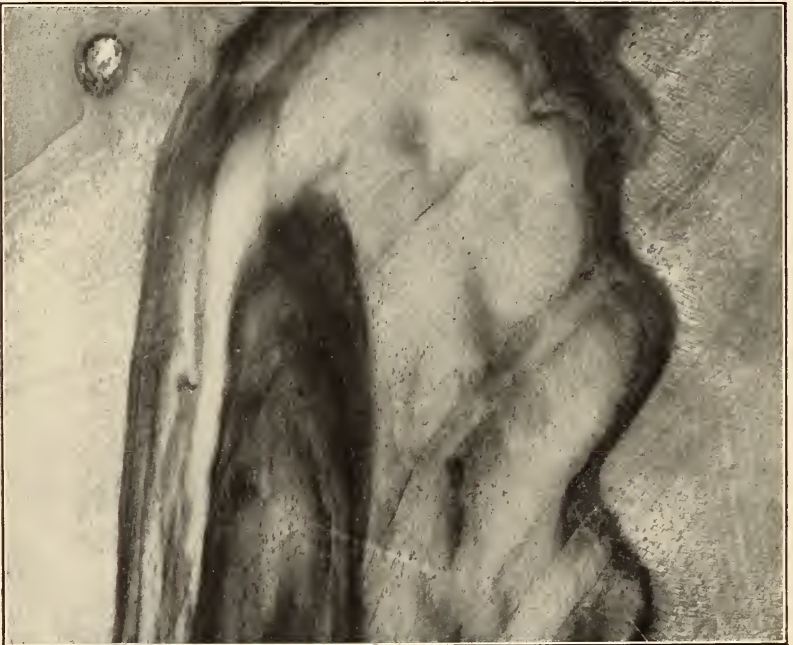
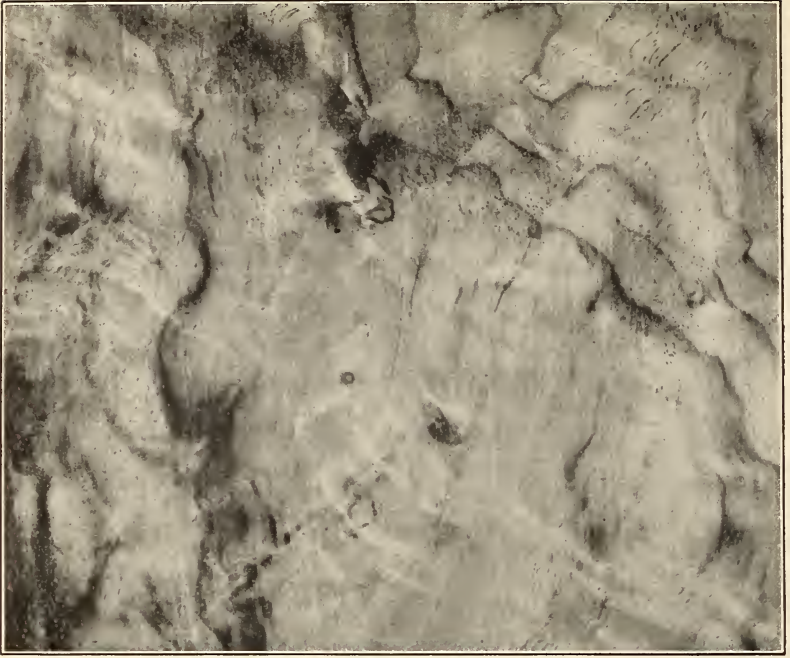
---

<sup>1</sup> See Forest Service Bulletin 103, "Distinguishing Characteristics of North American Gum Woods."

<sup>2</sup> *Juglans sieboldiana* Maxim., *J. mandshurica* Maxim., and *J. cordiformis* Maxim.

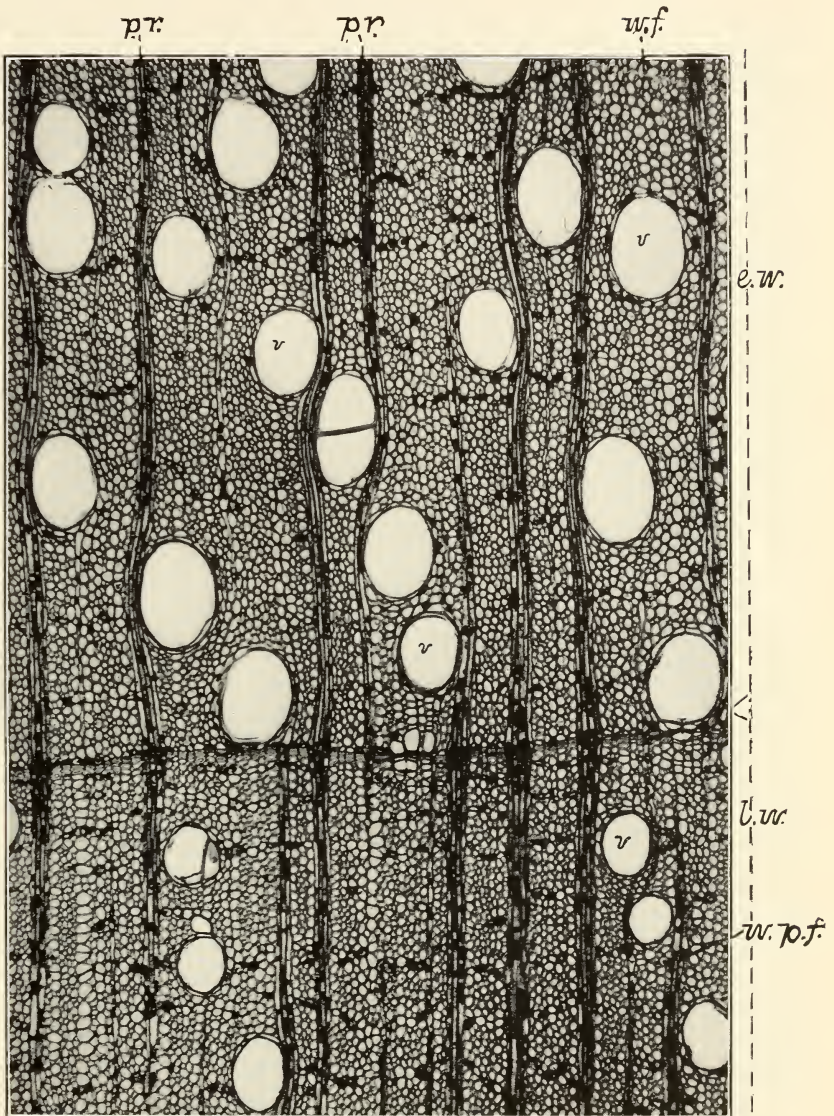


FIGS. 1 AND 2.—VENEER FROM STRAIGHT-GRAINED LOGS.



FIGS. 1 AND 2.—VENEER FROM CROOKED AND IRREGULAR LOGS.

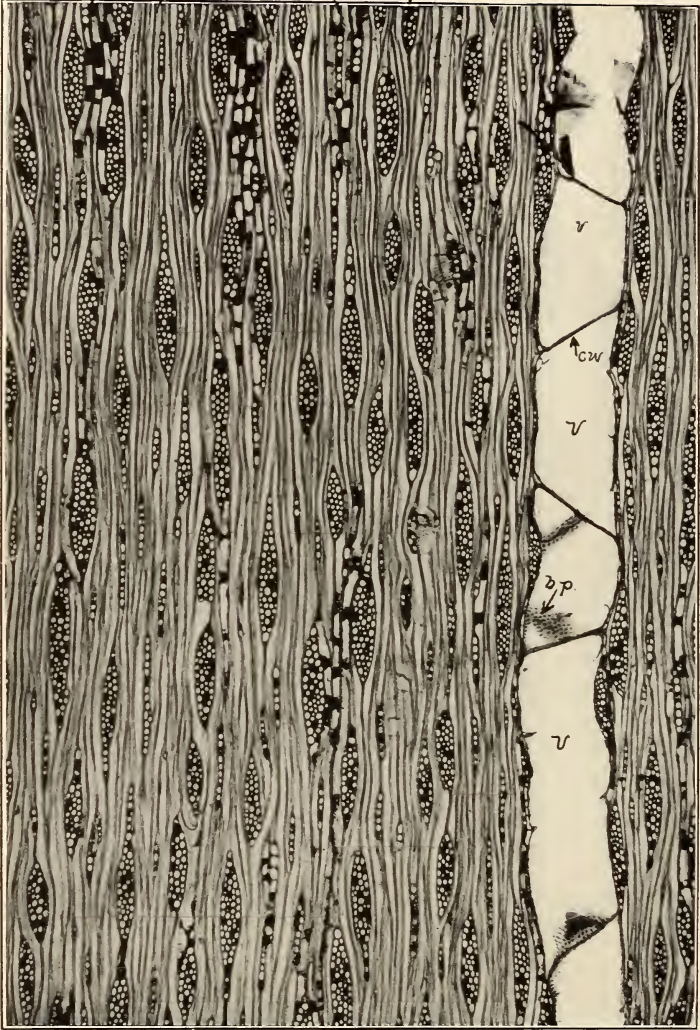




TRANSVERSE SECTION OF THE WOOD OF CIRCASSIAN WALNUT (*JUGLANS REGIA*).

*v.*, vessels; *p. r.*, pith rays; *w. f.*, wood fibers; *w. p. f.*, wood-parenchyma fibers; *e. w.*, early wood; *l. w.*, late wood. Magnified 50 diameters.

*w. p. f.* *w. f.* *w. p. f.* *p. r.*



TANGENTIAL SECTION OF THE WOOD OF CIRCASSIAN WALNUT (*JUGLANS REGIA*).

*v*, vessel; *p. r.*, pith ray; *w. f.*, wood fibers; *w. p. f.*, wood-parenchyma fibers; *c. w.*, cross wall; *b. p.*, bordered pits. Magnified 50 diameters.

*w.p.f.*

*w.p.f.*

*w.f.*



RADIAL SECTION OF THE WOOD OF CIRCISSIAN WALNUT (*JUGLANS REGIA*).

*v.*, vessel; *p. r.*, pith ray; *w. f.*, wood fibers; *w. p. f.*, wood-parenchyma fibers. Magnified 50 diameters.

